

```
#include <time.h>
#include <stdio.h>
#include <stdlib.h>
```

```
void swap(int *a, int *b)
{
```

```
    int temp = *a;
```

```
    *a = *b;
```

```
    *b = temp;
```

```
}
```

```
void heap(int arr[], int n, int i)
```

```
{
```

```
    int largest = i;
```

```
    int l = 2 * i + 1;
```

```
    int r = 2 * i + 2;
```

```
    if (l < n && arr[l] > arr[largest])
```

```
        largest = l;
```

```
    if (r < n && arr[r] > arr[largest])
```

```
        largest = r;
```

```
    if (largest != i)
```

```
    {
```

```
        swap(&arr[i], &arr[largest]);
```

```
        heap(arr, n, largest);
```

```
    }
```

```
}
```

```
void heapSort(arr[], int k)
{
```

```
    for (int i = k / 2 - 1; i >= 0; i--)
        heap(arr, k, i);
```

```
    for (int i = k - 1; i > 0; i--)
    {
        heap(arr, k, i);
        swap(arr[0], arr[i]);
        heap(arr, i, 0);
    }
```

```
}
```

```
int main()
{
```

```
    clock_t start, end;
    double kk;
```

```
    for (int n = 100; n < 601; n = n + 100)
```

```
    {
        int array[n];
        for (int i = 0; i < n; i++)
        {
            array[i] = rand() % 1000;
        }
    }
```

```
start = clock();  
heapSort(array, n);  
end = clock();  
kk = ((double)(end - start)) / CLOCKS_PER_SECOND;  
printf("In Time taken by Heap Sort for  
%d elements : %lf\n", n, kk);  
}
```

}

Modification

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IBM17CS040

```
void minheap(int arr[], int nn, int i)
{
    int smallest = i;
    int l = 2*i + 1;
    int r = 2*i + 2;

    if (l < n && arr[l] < arr[smallest])
        smallest = l;
    if (r < n && arr[r] < arr[smallest])
        smallest = r;

    if (smallest != i) {
        swap(arr[i], arr[smallest]);
        minheap(arr, n, smallest);
    }
}

int main()
{
    int arr[] = {4, 6, 3, 1, 7}
    int n = sizeof(arr) / sizeof(arr[0]);
    heapSort(arr, n);

    // #print the array.
}
```